Able Acoustics

CHARING HEALTHCARE

PARK VIEW SUITE

INTERNAL SOUND LEVEL MEASUREMENTS

JUNE 2016

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P1204/01	***June 2016***	***Position***	***Signature***
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1. INTRODUCTION

1.1.1 Mr Osman Charing[1] has constructed a "*1.5 storey building with link extension to main building to house additional accommodation, ancillary offices, meeting room and retention of bunker below to serve existing residential care home (C2 use).*" At Municpal Buildings, Canterbury Street, Gillingham, Kent, ME7 5AY.[2]

1.1.2 The local planning authority Medway Council have granted full planning permission for the development subject to conditions, one of which relates specifically to noise.

1.1.3 Charing Healthcare has therefore commissioned Able Acoustics Ltd to undertake sound level measurements within the premises to determine whether or not the internal noise levels within the newly constructed premises meet the recommended guideline values put forward by the relevant guidance referenced within the Planning Condition.

1.1.4 Sound level measurements have been undertaken at the site for a period of at least 24 hours and the resulting measured levels are presented in this report.

[1] Referenced name from the Planning Application MC/11/0719
[2] Referenced site location from the Planning Application MC/11/0719

2. UNITS AND STANDARDS

2.1 General

2.1.1 The range of audible sound is from 0 dB to 140 dB and a range of typical levels is presented in Table 2.1 below:

Table 2.1 Typical Sound Levels

Sound Pressure Level dB(A)	Source	Subjective Level
130 - 140	Jet (at 10m)	Threshold of pain
120 – 130	Pneumatic Drill (at 1m)	Extremely Loud
110 – 120	Loud Car Horn (at 1m)	Very Loud
100 – 110	Alarm Bell (at 1m)	Very Loud
80 – 90	Inside General Factory	Loud
70 – 80	Average Traffic (on street corner)	Loud
60 – 70	Conversational Speech	Moderate
50 – 60	Typical Business Offices	Moderate
40 – 50	Living-room Urban Area	Quiet
30 – 40	Library	Quiet
20 – 30	Bedroom (at night)	Very Quiet
10 - 20	Broadcasting Studio	Very Quiet

2.1.2 Noise is a subjective term and can be defined as unwanted sound.

2.1.3 For variable sound sources such as traffic, a difference of 3 dB(A) is just distinguishable. For road traffic or railway sound sources, a doubling of traffic flow will increase the overall sound by 3 dB(A). The "loudness" of a sound is a purely subjective parameter, but it is generally accepted that an increase/decrease of 10 dB(A) corresponds to a doubling/halving in perceived loudness.

2.1.4 The frequency response of the ear is usually taken to be about 20 Hz (number of oscillations per second) to 20 kHz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the measuring instrument. The weighting which is most widely used and which correlates best with subjective response to sound is the dB(A) weighting. This is an internationally accepted standard for environmental sound measurements.

2.1.5 External sound levels are rarely steady, but rise and fall according to activities within an area at any given time. In an attempt to produce a figure that relates this variable sound level to subjective response, a number of indices have been developed. These include:

i) $L_{Aeq,T}$ Sound Level

This is the "equivalent continuous A-weighted sound pressure level, in decibels", and is defined in British Standard BS 7445 [1] as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe sound attributable to construction and sound from industrial premises and is the most suitable unit for the description of other forms of environmental sound. In simpler terms, it is a measure of energy within the varying sound.

ii) The L_{Amax} level

This is the maximum A-weighted level recorded over the measurement period. The L_{Amax} may sometimes be used for assessing environmental noise where infrequent instances of elevated levels may occur that have minimal influence on the L_{Aeq} sound level. The L_{Amax} level is measured using the "fast" time response on the sound level meter unless otherwise stated.

2.2 Relevant Planning Condition

2.2.1 The Local Authority: Medway Council have raised concerns over the potential for noise affecting the proposed development and presented the following condition in the Notification of Grant of Planning Permission to Develop Land for Application Number MC/11/0719 [2] :

"1 Prior to the occupation of the development hereby permitted, a scheme of acoustic protection shall be submitted and approved in writing by the Local Planning Authority. The scheme must demonstrate that the internal noise levels within the residential units will conform to the good design range identified by BS 8233 1999: Sound Insulation and Noise Reduction for Buildings Code of Practice. All works which, form part of the approved scheme shall be completed before any part of the development is occupied and shall thereafter be maintained in accordance with the approved details.

Reason: To safeguard conditions of amenity in accordance with policy BNE3 of the Medway Local Plan 2003."

2.2.2 Guidance on internal noise levels is provided in British Standard (BS) 8233 [3]. With regard to residential accommodation, the following guidance reproduced in Table 2.2 below, is given:

TABLE 2.2: Indoor Ambient Noise Levels in Spaces When They Are Unoccupied

Criterion	Typical situations	Design range $L_{Aeq,T}$	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms [a]	30	35
[a] For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}.			

2.2.3 The calculation and prediction of internal levels is a complex process, dependent upon many factors including the noise level arriving at the external facade, the sound insulation properties of the wall/windows, the size of the rooms and any furnishings

present. The level of sound insulation offered by brick is significantly higher than window units and it is standard practice to assess noise levels external to facades containing windows, except where a high level of sound insulation is required prior to construction.

2.2.4 Following telephone conversations with Stuart Steed of the Environmental Health Team at Medway Council[3] and for the purpose of this assessment it has been agreed that measurements shall be taken internally in the Park View Suite Building for a residential room at ground floor level facing the car park area.[4]

[3] Record of telephone conversation 16th June 2016, 11:54hrs.
[4] NB BS8233 provides a method for calculating internal noise levels from measured external noise levels, which would be standard practice where a scheme of sound insulation is required to be submitted prior to development commencing.

3. SITE LAYOUT AND ENVIRONMENT

3.1.1 The development site is located off Canterbury Road, in Gillingham Road and comprises one link detached building. The building is two storeys in height with habitable rooms located on the ground and first floors.

3.1.2 The site is located in a suburban area noted to be primarily residential and is bounded by Gillingham Park to the north, The Charing Healthcare “Pagoda Building” to the east, residential properties (Numbers 14-24) located on Stuart Road to the south and the Charing Healthcare “Main Building” to the west.

3.1.3 The site location is shown on Figure 01.

4. NOISE MEASUREMENTS

4.1 General

4.1.1 In order to establish representative internal sound levels at the site, unattended noise monitoring was undertaken between 13:11 hours on Monday 27th June 2016 and 18:37 hours on Tuesday 28th June 2016. The measurement location was in Room 33 of the Park View Suite at ground floor level and is shown in Figure 02.

4.2 Instrumentation

4.2.1 The instrumentation used for the testing is detailed below:

- Rion type NL-52 Sound Level Meter (Serial No. 01143557)
- Rion type NH-25 Pre-amplifier (Serial No. 43574)
- Rion Type UC-59 Microphone (Serial No. 07366)
- Rion Type NC-74 Sound Level Calibrator (Serial No. 34936366)

4.2.2 All instrumentation used is conformant with IEC 61672-1:2002[4], IEC 61260-1:1995[5] and IEC 60942:2003[6] for Class 1 instrumentation and is within current validity periods of calibration at the time of testing. Relevant conformance and calibration certificates are presented in Appendix A.

4.2.3 Before and after the survey period, the calibration of the instrumentation was checked to a reference level of 94.0dB using the acoustic calibrator and no drift was noted.

4.2.4 The microphone was mounted on a tripod at height of 1.4m and at a distance of at least 1.5m from any walls following the Association of Noise Consultants guidelines for noise measurements in buildings [7] and the meter was set to record the following metrics automatically over 5 minute periods using the fast time response:

- L_{Amax}
- L_{Aeq}

4.2.5 The unit was also set to trigger make a waveform recording where levels exceeded 45dB(A).

4.2.6 At the start of the measurement survey the acoustic environment was subjectively considered to be primarily attributable to sound from staff movements and from voices in the Park View Suite. Pedestrian and vehicle sound from outside the building was also audible. At the end of the measurement survey the acoustic environment was subjectively considered to be primarily attributable to residents and staff voices within the building. It was further noted that there were no significant construction or maintenance works taking place in the vicinity of the Park View Suite Building and conditions have been assumed to be “typical”.

4.2.7 It is further noted that the property was furnished with both hard and soft surface finishes present.

4.2.8 Windows were locked shut, however, trickle vents were open for the duration of the survey period to replicate a situation relying on closed windows to achieve the desired internal level, but still permitting ventilation.

4.3 Measurement Results

4.3.1 The measured daytime and night time L_{Aeq} levels are summarised in table 4.1 below.

TABLE 4.1: Measured Internal Levels

Period	Measured Level dB(A)	Measurement Quantity	Limit Value	Level difference dB
Ground Floor Livingroom/Bedroom (Room 33)				
27/06/2016 Daytime (14:00 to 23:00 hours)	27.2	$L_{Aeq, 16hr}$	30	-2.8
27/06/2016 Night time (23:00 to 07:00 hours)	21.0	$L_{Aeq, 8hr}$	30	-9.0
28/06/2016 Daytime (07:00 to 14:00 hours)	31.1	$L_{Aeq, 16hr}$	30	+1.1

NB the first and last measurement periods were not a complete 16 hour period.

4.3.2 It is understood from a review of the waveform recordings that the noise measurements may have been adversely influenced by persons moving around the premises during the survey, this is consistent with instances of raised levels which corresponding to waveform recordings of doors closing.

4.3.3 The period from 13:11 to 14:00 on Monday 27th June 2016 has been discounted for the purpose of this assessment as it is not a complete 1-hour period and nor is it free from the influence of staff activity within the vicinity of the microphone.

4.3.4 The period from 14:00 hours on Tuesday 28th June 2016 to 18:37 has also been discounted due to rainfall outside the building which had the potential to adversely increase the measured levels. However it should be noted that measurements still cover a complete 24 hour period.

4.3.5 It is further considered that due to an increase in internal activity after 13:00 on the 28th June 2016 the daytime levels were adversely influenced. In the absence of the measurement data post 13:00 the daytime $L_{Aeq,T}$ value reduces to 28.9dB(A) which is 1.1dB below the 30dB(A) criterion value. This difference is unlikely to be perceptible to humans.

4.3.6 It is further noted that the logarithmic average of the combined daytime values from 14:00 to 22:59 on 27th June and from 07:00 to 13:59 on the 28th June is a total value of 29.1 $L_{Aeq,16hr.}$

4.3.7 Full measurement results are presented in graphical form in Figure 03 and in tabular form in Appendix B as hourly values. Any values which have been discounted due to adverse influence[5] have been highlighted in grey.

4.3.8 During the night time period, L_{Amax} levels (which have not been discounted) exceeded 45dB L_{Amax} on 16 occasions during the 8hr period commencing 23:00hrs on Monday

[5] Instances where raised levels were present during the night were identified during a review of wave file recordings and were all attributable to door closing sounds.

27th June 2016. These exceedences all originated within the building and were further considered to be attributable to door closing sounds. Following a telephone conversation with Stuart Steed of Medway Council[6] it is considered that exceedences attributable to internal operational activity as opposed to those originating from outside the building can be disregarded.

[6] Record of telephone conversation 29th June 2016, 10:57hrs.

5. CONCLUSIONS

5.1.2 Sound levels have been measured Room 33 of the Park View Suite at Canterbury Road, Gillingham, Kent, ME7 5AY. The $L_{Aeq,T}$ and L_{Amax} metrics have been measured continuously over 1-minute periods.

5.1.3 The $L_{Aeq,T}$ period noise levels were all below the recommended good design range limit for indoor ambient noise levels in spaces when they are unoccupied for both the daytime and night time periods with the exception of those measured on the 28th June during the day. The levels measured during the day on the 28th June were influenced by both adverse weather and internal activity post 13:00hrs and in the absence of this the measurement result is below the 30dB(A) good design range criterion limit value given by BS 8233:1999.

5.1.4 The combined daytime values between 14:00-22:59hrs on the 27th June and 07:00-13:59hrs on the 28th June give a value of 29.1 $L_{Aeq,16hr.}$ This is below the good design range criterion limit value given by BS 8233:1999. Following email correspondence with conversations with Stuart Steed of Medway Council's Environmental Health Department[7] it has been agreed that this is an acceptable method for presenting the data for the purpose of this assessment.

5.1.5 The L_{AMax} noise levels during the night exceeded the recommended limit for indoor noise levels on 16 occasions, however these were noted to be attributable to sound sources within the operational Park View Suite healthcare building not from outside and as such, can be disregarded.

5.1.6 In conclusion the building is compliant with the levels referenced by the relevant planning condition for both the daytime and night time periods, and further that the relevant planning condition can be discharged.

[7] Email sent 16:37 Thursday 30th June 2016

6. REFERENCES

1. British Standards Institution. British Standard 7445: Description and Measurement of Environmental Noise, Part 1. Guide to Quantities and Procedures, 1991.

2. Medway Council. Notification of Grant of Planning Permission to Develop Land, Application Number MC/11/0719, Condition 1, 25/05/2011.

3. British Standards Institution. British Standard 8233: Sound insulation and noise reduction for buildings Code of practice, 1999

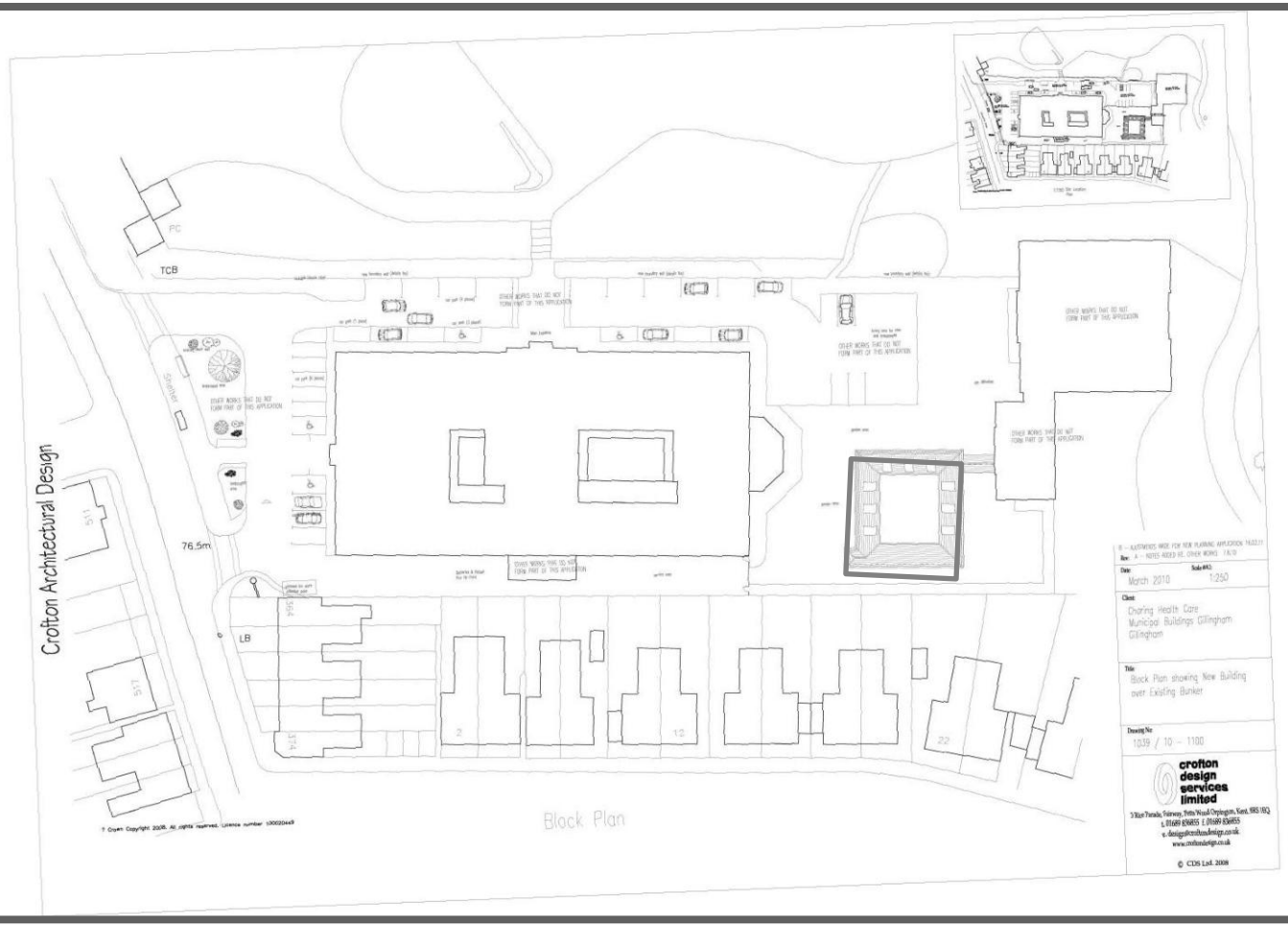
4. International Electrotechnical Commission IEC 60942:2003, Electroacoustics - Sound calibrators, edition 3, 2003.

5. British Standards Institution 61672-1 Electroacoustics. Sound level meters. Specifications, 2002.

6. International Electrotechnical Commission 61260, Electroacoustics. Octave-band and fractional-octave-band filters, 1995.

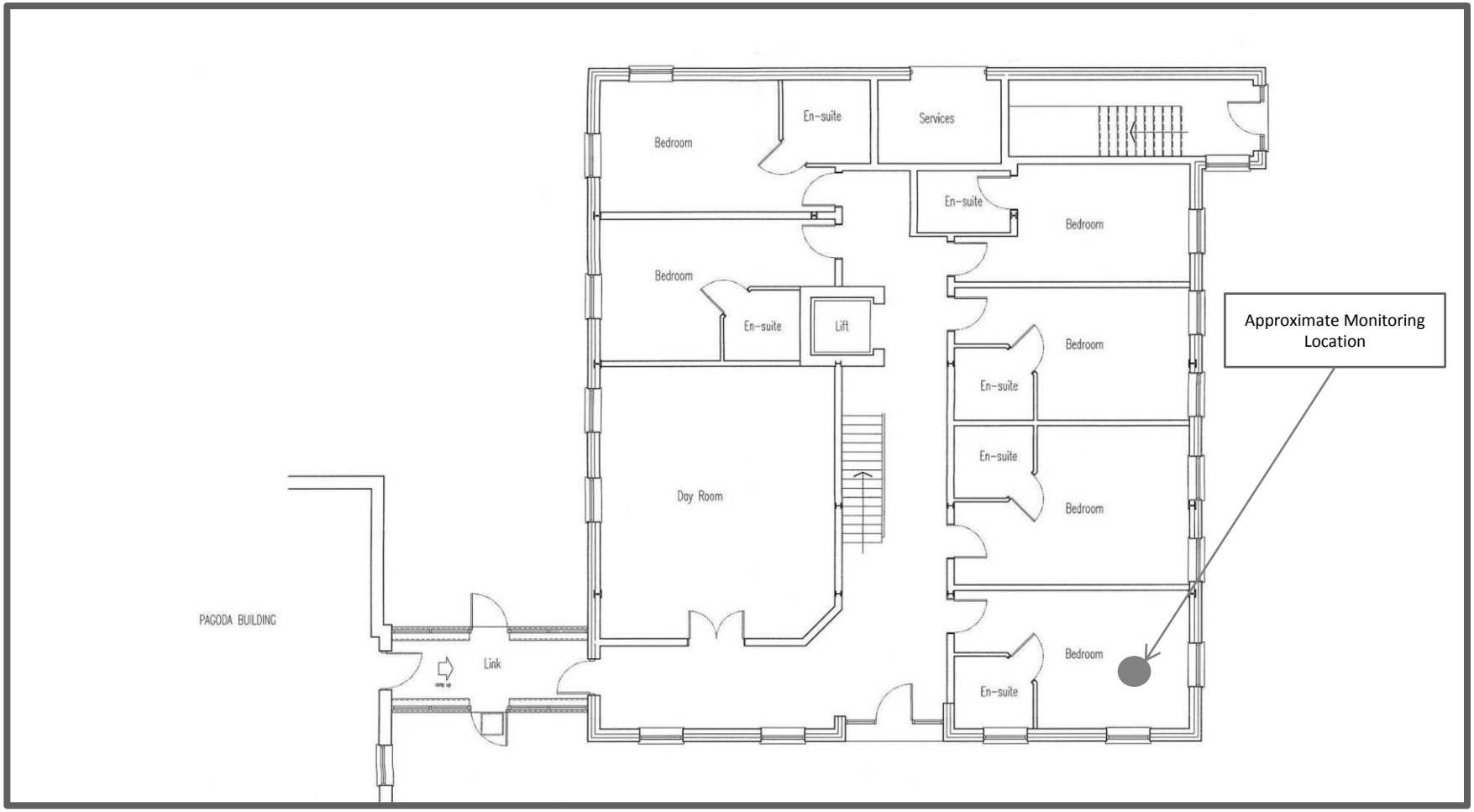
7. The Association of Noise Consultants, ANC Guidelines, Noise Measurement in Buildings, Part 2 Noise from External Sources, Feb 2013.

FIGURES



Not To Scale Resized from Original Drawing

Project	No.	Drawing	No.	File	Date
Charing Healthcare	P1204	Site Location	Figure 01	P1204/Figures.ppt	29/06/2016



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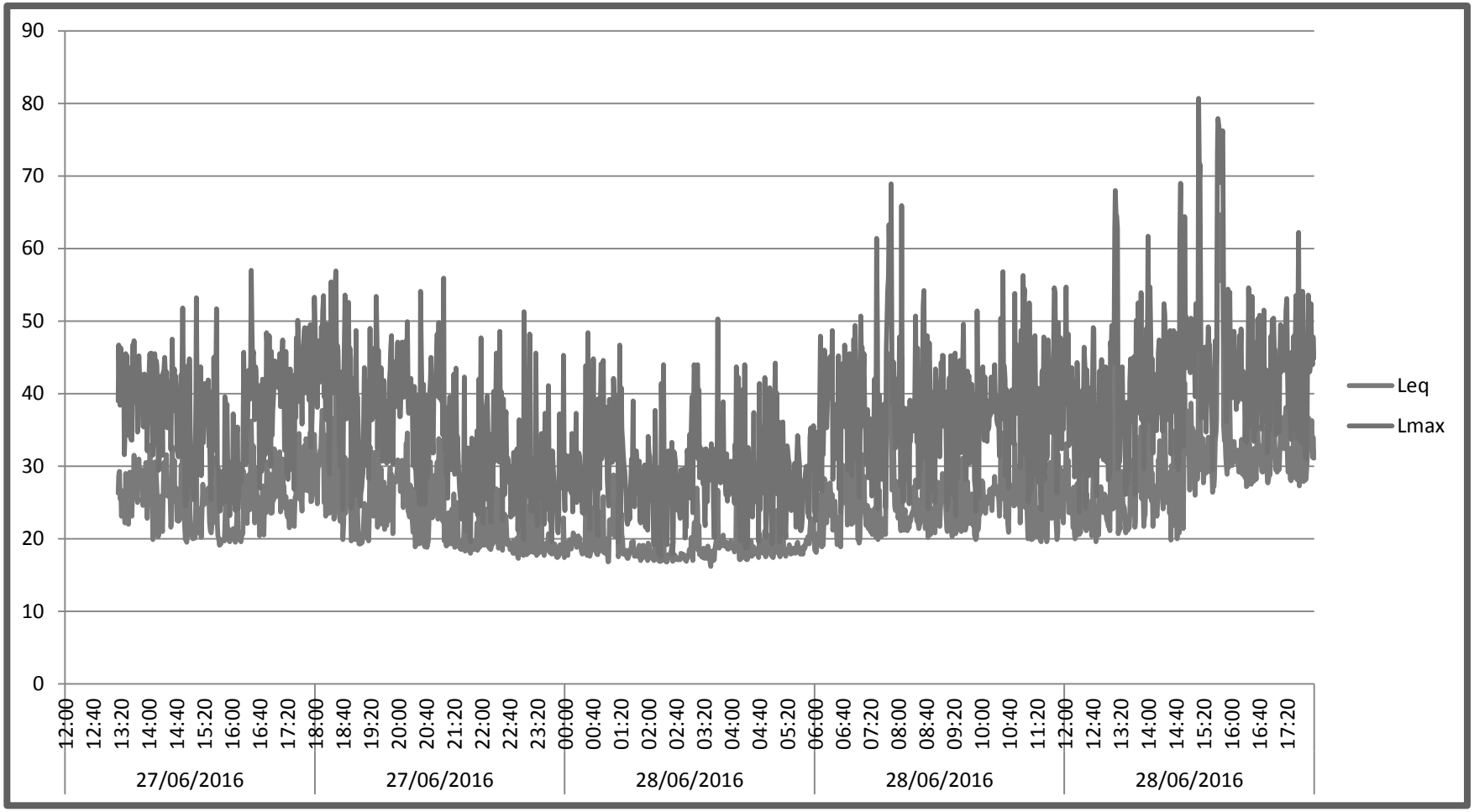
Project	No.	Drawing	No.	File	Date
Charing Healthcare	P1204	Measurement Location (Ground Floor Room 33)	Figure 02	P1204/Figures.ppt	29/06/2016



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Project	No.	Drawing	No.	File	Date
Charing Healthcare	P1204	Measurement Results (Ground Floor, Room 33)	Figure 03	P1204/Figures.ppt	29/06/2016

APPENDIX A

Calibration Certificates

CERTIFICATE OF CALIBRATION

Date of Issue: 04 May 2016

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Certificate Number: TCRT16/1107

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Approved Signatory

M. Breslin [ ] K. Mistry [ ] J. Harriman [ ]

Customer	Able Acoustics Unit 20 Connect 10 Business Park Foster Road Ashford Kent TN24 0FE			
Order No.	P1000			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	01143557
	Rion	Firmware		1.7
	Rion	Pre Amplifier	NH-25	43574
	Rion	Microphone	UC-59	07366
	Rion	Calibrator	NC-74	34536109
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 2.SLM 61672-3 TPS-49 *Procedures from IEC 61672-3:2006 were used to perform the periodic tests.*			
Type Approved to IEC 61672-1:2002	YES	Approval Number	21.21 / 13.02	
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003			
Date Received	29 April 2016	ANV Job No.	TRAC16/04071	
Date Calibrated	04 May 2016			

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION 7623

Date of Issue: 18 February 2016 **Certificate Number: UCRT16/1061**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory
M. Breslin [ ] K. Mistry [ ] J. Harriman [✓]

Customer	Able Acoustics Unit 20, Connect 10 Business Park Foster Road Ashford Kent TN24 0FE
Order No.	P1000
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-74	34936366

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS16/02028	
Date Received	17 February 2016	
Date Calibrated	18 February 2016	
Previous Certificate	*Dated*	21 April 2015
	Certificate No.	UCRT15/1044SUP
	Laboratory	7623

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

APPENDIX B

Measurement Results

Appendix B: Results of Unattended Monitoring

Project Number:	**P1204**
Client:	**Charing Healthcare**
Location:	**Ground Floor Room 33**
Mic Height:	**1.4m**
Time Weighting:	**Fast**
Frequency Weighting:	**A**

Instrumentation	Serial No.
Rion NL-52 Sound Level Meter	01143557
Rion NH-25 Pre-amp	43574
Rion UC-59 Microphone	07366
Rion NC-74 Calibrator	34936366

Calibration prior to survey:	**94.0 dB (re 94.0)**
Calibration after survey:	**94.0 dB (re 94.0)**

Date	Start Time	L_{Aeq}	L_{Amax}
27/06/2016	*13:16*	*27.2*	*47.3*
27/06/2016	14:00	27.4	51.8
27/06/2016	15:00	23.9	53.2
27/06/2016	16:00	26.7	57.0
27/06/2016	17:00	29.2	53.3
27/06/2016	18:00	30.9	56.9
27/06/2016	19:00	26.8	53.4
27/06/2016	20:00	27.4	54.1
27/06/2016	21:00	23.6	55.9
27/06/2016	22:00	21.0	48.6
27/06/2016	23:00	20.3	51.3
28/06/2016	00:00	20.4	48.4
28/06/2016	01:00	20.0	46.7
28/06/2016	02:00	17.8	44.0
28/06/2016	03:00	19.9	50.3
28/06/2016	04:00	19.7	44.0
28/06/2016	05:00	19.6	44.2
28/06/2016	06:00	25.3	49.4
28/06/2016	07:00	34.3	68.9
28/06/2016	08:00	29.3	65.9
28/06/2016	09:00	25.3	51.4
28/06/2016	10:00	27.7	56.8
28/06/2016	11:00	27.8	56.3
28/06/2016	12:00	25.6	54.7
28/06/2016	13:00	35.6	68.0
28/06/2016	*14:00*	*38.3*	*69.0*
28/06/2016	*15:00*	*54.0*	*80.7*
28/06/2016	*16:00*	*32.2*	*54.6*
28/06/2016	*17:00*	*33.6*	*62.2*
28/06/2016	*18:00*	*47.6*	*85.2*

Cells highlighted in grey have been discounted for this assessment due to being incomplete 1 hour periods or falling beyond the 24 hour cut off